

1 – 2 HEALTH IMPACTS OF RADIOACTIVE WASTE

Regulatory agencies take the charge of “protecting human health and the environment” very seriously. This protection is established by having standards in place that protect the radiation worker, a member of the public, or a person who may inadvertently come in contact with radioactive waste. Commercial waste facilities pose minimal risk since they are permitted/licensed, inspected, and monitoring by the Department.

- Radiation is all around us. Every human being receives a certain dose of radiation every day of our existence. This is commonly referred to as “background radiation.” On average, every human receives about 1 millirem per day in radiation exposure (360 millirems/year). (For more information, refer to page 18-19 of "Understanding Radiation in Our World" published by the National Safety Council")
- In Utah, there are approximately 200 users of radioactive materials. Categories include medical (e.g., nuclear medicine for diagnosis and treatment), industrial (e.g. industrial radiography, well logging, moisture density gauges, flowmeters, sterilization of medical supplies), academic (e.g., research applications), and waste disposal (e.g., license for land disposal (Envirocare) or decay in storage (RWM-Utah). (See http://www.deq.state.ut.us/EQRAD/drc_ram.htm)
- The primary routes of exposure from radioactive waste are dependent on radionuclides contained within the waste which emit three types of radiation: alpha, beta, and gamma radiation. Radionuclides (sometimes referred to as isotopes or radioisotopes) that emit alpha and beta radiation cause greater exposure problems for individuals when inhaled or ingested. Gamma rays may penetrate the body and damage tissues. [For a more detailed discussion, see pages 14-16, "Understanding Radiation in Our World" published by the National Safety Council"]
- Exposure is also dependent on: the time that someone is exposed to a radiation source (less time, less exposure), the distance from the radiation source (as one moves away from the source, the exposure is less), and shielding (use of barriers such as lead or concrete reduce exposure to gamma radiation).
- Health effects associated with high levels radiation have been well documented as a result of studies associated with atomic bomb victims during World War II. Assumptions have been made and standards set for exposure to much lower levels of radiation and a conservative approach has been applied because scientific evidence of low-level exposure is much less clear. Effects can also be characterized as acute (usually a exposure of short duration to a high radiation source which may cause radiation burns, radiation sickness, or death) or chronic (exposure to a radiation source over a long period of time that may result in cancer). (For more detailed information, see discussion on pages 33-44, "Understanding Radiation in Our World" published by the National Safety Council")

- National radiation exposure limits are set by the Nuclear Regulatory Commission and adopted by the states for the following:
 - Radiation workers may receive up to 5000 millirems/year exclusive of background radiation (See Utah Radiation Control rule R313-15-201)
 - A member of the public may receive up to 100 millirems/year exclusive of medical administrations and background radiation (See Utah Radiation Control rule R313-15-301)
 - Determination of the classification of radioactive waste involves two considerations. First, consideration is given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides should cause exposure. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration should be given to the concentration of short-lived radionuclides for which requirements on institutional controls, waste form, and disposal methods are effective. (See Utah Radiation Control rule R313-151008(1)(a).
 - To compare, a lethal dose of radiation from a single exposure to a radiation source occurs between 300,000 and 500,000 millirems
- Users of radioactive materials and waste disposal facilities have prescribed radiation safety programs that are intended to limit worker's exposure. A principal used widely in the industry is "ALARA (as low as reasonably achievable) in terms of limiting exposure to radiation. Radiation workers are typically monitored. The most common form of monitoring is the personal dosimetry (film badge) that indicates the amount of exposure over a period of time.
- Regulatory standards for commercial radioactive waste facilities are found in Utah Radiation Control rules (R313-25) that is equivalent to federal rules (10 CFR Part 61). These standards are designed to protect the public and workers from radiation exposure.
 - New facilities must meet the siting criteria established by rule (see R313-25-3)
 - Facilities must complete a licensing process and be issued a license in order to operate. The licensing process is significant in terms of costs and time. A licensing process for a commercial facility typically takes 2-3 years. The Department is authorized to collect up to \$1,000,000 in fees to support the licensing process. One of the major components of the licensing process is the "performance assessment" where the site undergoes a modeling process to ensure that all regulatory standards will be met.
 - Once licensed, facilities must abide by conditions of the license and standards outlined in R313-25. Some of these standards include:

- Controlled access to the facility (the area where waste is disposed is called the "restricted area" and individuals exiting this area must be surveyed for radiologic contamination)
- Workers inside the restricted area may be required to wear certain personal protective equipment (tyvek suits, hard hats, steel-toed shoes, respirator)
- There are regulatory standards for exposure to members of the public at the fence line of the restricted area of the facility
- The disposal practices prescribed in the license ensure that upon closure of the facility that the waste is isolated from inadvertent intrusion.